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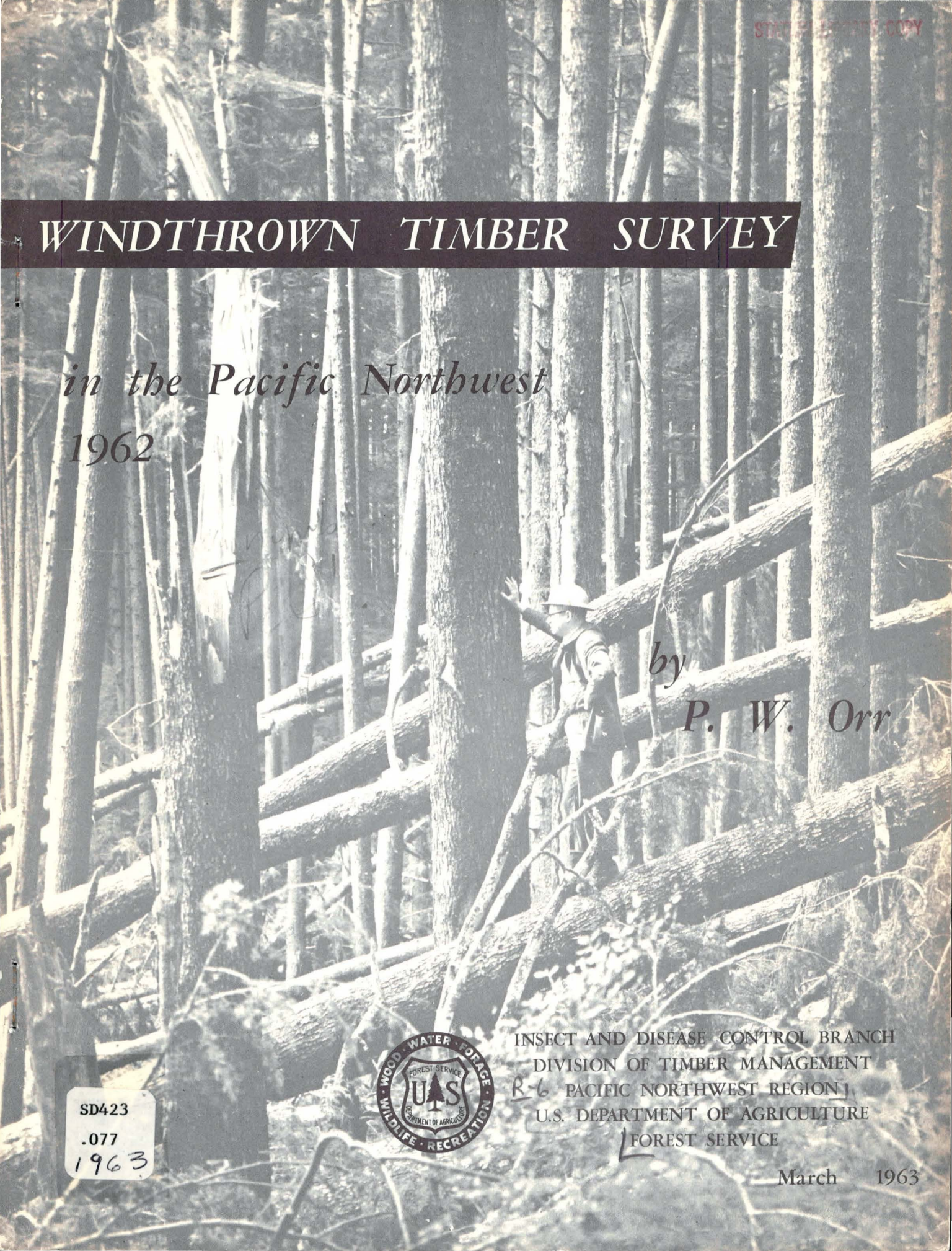
WINDTHROWN TIMBER SURVEY

in the Pacific Northwest

1962



by

P. W. Orr

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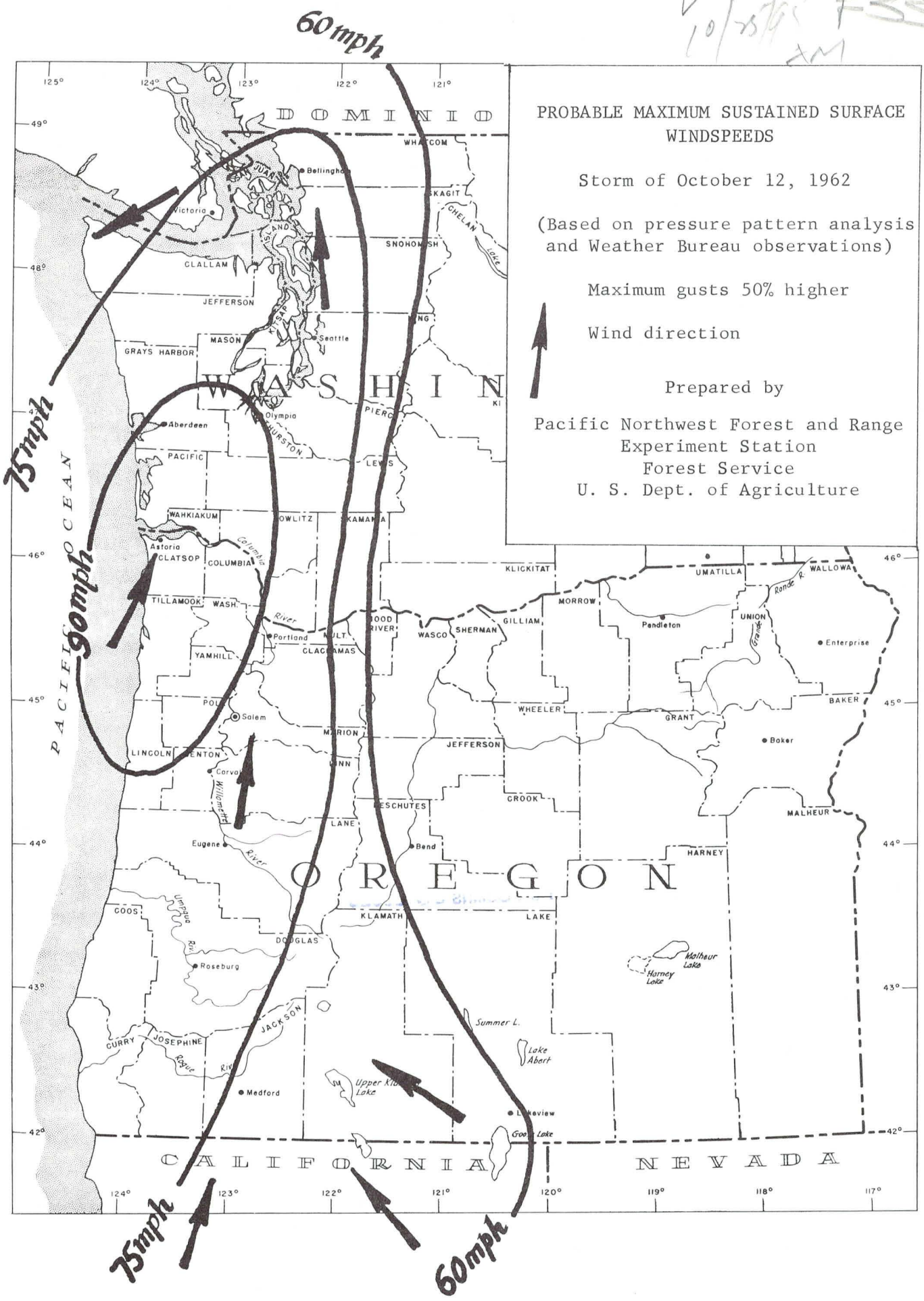
1963

INSECT AND DISEASE CONTROL BRANCH
DIVISION OF TIMBER MANAGEMENT
R-6 PACIFIC NORTHWEST REGION
U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE

March 1963

The combined efforts of many organizations and individuals made this survey possible. Special acknowledgement is made to the principal cooperators: Oregon State Department of Forestry, Washington State Department of Natural Resources, Bureau of Land Management, and industrial foresters in both States.

Cover background: Concentration of timber blown down by the October 12, 1962 storm on the Cascade Head Experimental Forest, on the Oregon Coast.


PROBABLE MAXIMUM SUSTAINED SURFACE WINDSPEEDS
Storm of October 12, 1962
(Based on pressure pattern analysis and Weather Bureau observations)
Maximum gusts 50% higher
Wind direction
Prepared by
Pacific Northwest Forest and Range Experiment Station
Forest Service
U. S. Dept. of Agriculture
60mph
75mph
90mph
75mph
60mph
PACIFIC OCEAN
CANADA
WASHINGTON
OREGON
CALIFORNIA
NEVADA
Victoria
Bellingham
Seattle
Olympia
Aberdeen
Astoria
Portland
Salem
Eugene
Corvallis
Roseburg
Medford
Pendleton
Enterprise
Baker
Bend
Lakeview
Goose Lake
Summer L.
Lake Abert
Upper Klamath Lake
Malheur Lake
Harney Lake
Columbia River
Willamette River
Umpqua River
Rogue River
Grande Ronde R.
JUAN DE FUCA STRAIT
PUGET SOUND
WHATCOM
SKAGIT
CHELAN LAKE
SNOHOMISH
CLALLAM
JEFFERSON
KITSAP
KING
MASON
GRAYS HARBOR
PIERCE
THURSTON
LEWIS
PACIFIC
WAHKIAKUM
COWLITZ
SKAMANIA
KLICKITAT
CLATSOP
COLUMBIA
TILLAMOOK
WASH.
MULT.
CLACKAMAS
HOOD RIVER
WASCO
SHERMAN
GILLIAM
MORROW
UMATILLA
WALLOWA
UNION
YAMHILL
POLK
MARION
LINCOLN
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LINN
JEFFERSON
WHEELER
GRANT
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Figure 1.--Generalized areas of concentrated windthrown timber in Oregon and Washington caused by the October 12, 1962 storm

Figure 2.--1962 blowdown survey areas

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SUMMARY

A cooperative survey of windthrown timber in Oregon and Washington was coordinated by the U. S. Forest Service following the October 12, 1962 windstorm. Results of this survey show that 11.19 billion board feet of timber was blown down. Of this, about 6.57 billion board feet of sawtimber was blown down in concentrated patches and an additional 4.62 billion board feet went down as individual trees and in small groups scattered throughout the sawtimber stands in both States. This volume of damaged timber amounts to about the total log production in both States during 1961.

In addition to the timber actually blown down, broken off, or tipped over, the storm left a considerable amount of needles, limbs, and other debris strewn over the forest floor. This will add significantly to the fire prevention job in the summer of 1963. Increased protection costs on National Forest lands will range from nothing on some eastern Oregon and Washington forests to about 25 percent on certain forests on the West Side. The average increase in fire protection costs on the National Forests alone will amount to about 8 percent. Other forest managers also face similar increased protection costs in both States.

Some of the concentrated blowdown has already been salvaged and eventually most will be despite apparently heavy breakage in some cases. Most of the scattered blowdown will probably never be salvaged because of its widely scattered nature and the low volumes per acre. It is this latter type of blowdown that may serve as breeding sites for Douglas-fir beetle populations in 1963, and could result in serious tree killing in 1964.

INTRODUCTION

On October 12, 1962, the most severe storm in historical times swept inland from the Pacific Ocean and moved northward along the coast of northern California, Oregon, and Washington, bringing hurricane-force winds to most of the Douglas-fir region (frontispiece). Wind velocities accompanying the storm reached an estimated 170 miles per hour in gusts at Mt. Hebo in the Oregon Coast Range. Elsewhere, gusts of 100 to 160 miles per hour were recorded before the instruments ceased to function or were blown away. The Coast Ranges in both States bore the brunt of the damage but severe windthrow also occurred in the Willamette Valley of Oregon, north to the Puget Sound area in Washington. Extensive damage also occurred in the Cascade foothills but winds subsided somewhat before reaching the Cascade Mountain summit. More than normal blowdown also occurred in south-central Oregon.

Subsequent storms caused additional windthrow in northwest forests. On November 25-26, winds reached 85 miles per hour at Astoria, Oregon, causing widespread power outages and considerable damage to forest stands. During this storm the "world's largest" Douglas-fir, near Astoria, Oregon, fell a victim of the wind.

A Timber Disaster Committee was appointed by the Northwest Forest Forest Pest Action Council at its October 19, 1962 meeting. This Committee was charged with evaluating the extent and intensity of the storm's damage to northwest forests. The Committee then asked the U. S. Forest Service to coordinate a regionwide survey to determine the amount of the timber damaged and to make a generalized map showing the concentrations of blown down timber in three classes--light, moderate, and heavy.

In 1952, a very detailed and comprehensive survey was made of the 1951 blowdown to map precise location and damage classes. Since then, forest management has become more intensive and forest land owners and managers have much better inventory data and are now far better able to assess their own blowdown problems and to take aggressive action. Because of this, a survey similar to the 1952 aerial survey was considered unnecessary. The 1962 survey was designed to give an over-all picture of the disaster in broad, generalized terms.

SURVEY METHODS

Immediately after the storm, most land managers of larger ownerships--private, state, and federal--made aerial surveys of their lands and began ground surveys to assess the extent and amount of the losses. Because this information was, or would be, available the survey data was obtained by: (1) Compiling survey data furnished by managers of private, state, and federal owners, and (2) making an aerial and ground survey on all other forest lands. The area to be surveyed in both of the above classes totaled 22.33 million acres, encompassing all western Oregon and Washington and parts of eastern Oregon (figure 1).

Forest Service Pest Control Funds were made available to finance the flying and salaries of additional observers. Industrial and other state and federal forest managers contributed to the survey by providing data and some manpower.

The Timber Disaster Committee sent out a questionnaire on November 8, 1962 to 45 industrial forest owners, asking for the blowdown volume estimate and a map of blowdown locations on their lands (figure 1). Replies to this questionnaire formed the basis for estimating the major part of the "private" blowdown losses shown in table 1. Similar data was received from the Oregon State Department of Forestry, Washington State Department of Natural Resources, Bureau of Land Management, and the National Forests.

This left approximately 6.44 million acres of commerical forest land in western Washington and Oregon on which the windthrow situation was unknown. Personnel from the Pacific Northwest Forest and Range Experiment Station and the Insect and Disease Control Branch, Division of Timber Management, U. S. Forest Service, designed a sampling plan and an aerial

survey to locate the concentrations of blowdown on these 6.4 million acres. Following the aerial phase of the survey, ground plots were established in both "concentrated" and "scattered" blowdown areas to determine the volume losses in these categories in both States.

Volumes were computed from local volume tables, compiled from forest inventory data sheets, supplied by the Division of Forest Economics, Pacific Northwest Forest and Range Experiment Station. From these data, the net volume curves were drawn for each tree species likely to be encountered.

Aerial survey.--Because of time limitations and unpredictable weather conditions, the actual aerial surveying was done on a priority basis. The first priority areas were those that had not previously been surveyed--principally small holdings in the Willamette Valley in Oregon and in the Grays Harbor, Pacific, Lewis, and Cowlitz Counties in Washington (figure 2). Second priority was given those areas where previous aerial surveys were sketchy. The third priority was assigned to those areas already surveyed but where some specialized problems required further surveys.

The approximate acreage of the various priority units shown below includes sawtimber stands, poletimber stands, reproduction, and non-forested lands within the gross survey area.

State	Priority area			Total
	First	Second	Third	
	Acres			
Washington	3,087,000	621,000	4,570,000	8,278,000
Oregon	3,358,000	1,863,000	8,833,000	14,054,000
Total	6,445,000	2,484,000	13,403,000	22,332,000

Aerial survey weather conditions deteriorated markedly in mid-November, soon after the first priority areas had been flown and mapped. Hence, aerial surveys on second and third priority areas were abandoned.

Four aerial survey crews, consisting of a pilot and two observers, made the survey. These crews flew predetermined flight lines four miles apart, mapping all "concentrated" blowdown within one mile on each side of the flight line. Thus, a 50 percent survey of the area was made. The blowdown was sketch-mapped in place on 15' or 7-1/2' U.S.G.S. quadrangle maps. At intervals of 15 miles along the flight lines all "concentrated" blowdown, 10 acres and larger, on a predetermined square mile was mapped on black-and-white aerial photos, in addition to that already mapped on the U.S.G.S. quadrangle maps. A regression equation between sketch-mapped and photo-mapped blowdown acreage was then developed from these data and was later used to adjust the sketch-mapped blowdown areas to compensate

for over, or undestimating blowdown volume in the final estimate. Aerial observers often overestimated the size of a blowdown patch by as much as 100 percent, particularly in the smaller sizes. The map scale used contributed partly to this error.

During all phases of the aerial survey, safe working practices were observed. Each crew filed flight plans with the local F.A.A. Station before each flight, giving standard flight information, and maintained radio contact with F.A.A. radio stations at hourly intervals during the flight. When more than one plane was working in the area, interplane contact was maintained on the unicom frequency, 122.8 Mc. Daily telephone contact was maintained between aerial crews and the survey headquarters at Portland when crews were in the field, allowing for planning and scheduling of survey flights the next day.

Aerial coverage of the 6.44 million acres of first priority areas required 60.3 hours of survey flying and 22.5 hours of ferry time. The flying was done between October 29 and December 12, 1962. The large amount of ferry time was necessary because crews frequently had to abandon the survey on certain areas because of cloud cover or storm conditions.

Ground survey.--Two different kinds of blowdown occurred in the October 12 storm. Where trees were blown down in patches, these concentrations could be mapped from the air and sampled to determine volume loss. Much of this type of loss occurred along cutting margins and in uncut stands (plate 1). Another kind of blowdown occurred as scattered single trees and small groups that were difficult or impossible to spot from the air (plate 3). Volume loss estimates on this type of blowdown could only be made by sampling the apparently undisturbed sawtimber stands on the ground.

As mentioned previously, sample areas one mile square were inspected from the air and all visible concentrated blowdown was marked on the photos. The sawtimber stands were typed on these sample photos to determine the sawtimber acreage. Blowdown sample plots were picked from "Continuous Forest Inventory" sample plots, falling within the survey areas and marked on the photos to sample the following kinds of blowdown:

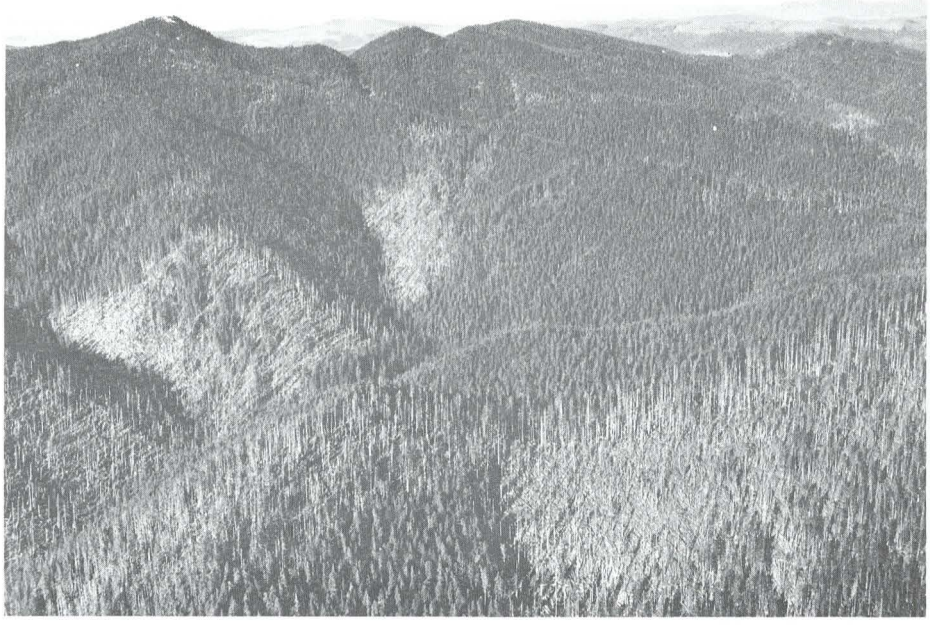
1. Concentrated - Patches 10 acres and larger on which 10 percent or more of the total number of stems are down.

2. Scattered - All other blowdown in sawtimber stands not meeting the above definition.

A total of 15 concentrated blowdown plots were sampled in Oregon and 16 in Washington. A horseshoe-shaped 2-acre plot, 5 chains x 10 chains x 5 chains, and 1 chain wide was used. In sampling for scattered blowdown, 25 plots were taken in Oregon and 11 in Washington. The plot size was 3 acres in a horseshoe-shape, 10 chains x 10 chains x 10 chains, and 1 chain

PLATE 1

"Concentrated" blowdown along a cutting margin in the Douglas-fir type. Some of the trees tipped over and others snapped off and shattered.



"Concentrated" blowdown in an uncut stand.

wide. In all cases, alternate plots were available for substitution if original plots were inaccessible, or the blowdown had already been salvaged. In both types of plots, the plot center line was run with a chain, using slope correction. All uprooted, tipped over, down, and broken trees within one-half chain on either side of the plot center lines were tallied by diameter and species. The first down tree on each plot and every tenth tree thereafter was a sample tree on which the total merchantable height, cull, and breakage due to wind was taken as a basis for determining the potential salvability of blowdown.

SURVEY RESULTS

The cooperative survey showed that the blowdown volume totaled 11.19 billion board feet. Volume of blowdown, distribution by state, area, and agency and type of blowdown are summarized in table 1. In the table, "gross volume" of blowdown is the inventory volume, and "net volume" is the potentially salvable volume after deducting extraordinary breakage due to the storm. Two distinct types of blowdown were found; each presents special problems from the salvage standpoint and potential beetle increase. One type occurred in concentrated patches, covering 10 acres or more and in a few exceptional cases, areas up to one-half square mile (plates 1 and 2). The other type of blowdown occurred as scattered individual trees and small groups of trees in sawtimber stands over rather extensive areas (plate 3).

The majority of the concentrated blowdown resulting from the storm was centered in Grays Harbor, Pacific, Wahkiakum, Cowlitz, Lewis, Snohomish, and Jefferson Counties in Washington and in Coos, Clatsop, Columbia, Lane, Tillamook, Benton, and Curry Counties in Oregon (figure 1).

Scattered blowdown occurred to varying degrees in almost all sawtimber stands in both States. The scattered type of blowdown appeared to be proportionately heavier where the concentrated blowdown was light, indicating a fairly uniform distribution of this type of blowdown.

The average net blowdown volume per acre on sample plots was as follows:

State	Blowdown volume per acre		Plots sampled
	Concentrated	Scattered	
	- Board feet -		No.
Washington	4,475	1,046	27
Oregon	22,664	1,123	40
Average	13,569	1,084	--

The difference in per acre volume of concentrated windthrow in the two States is because sample plots in Washington fell mainly in the smaller sawtimber stands on private lands in the valleys. Many of these stands were second growth. In Oregon, most concentrated blowdown plots were sampled in large sawtimber stands. It should be recognized that the scattered windthrow situation has not been adequately sampled because of the extensive area over which it was distributed, and the inaccessibility of many of the stands. As more intensive surveys are made during the 1963 field season, the reported volume of the scattered windfall will probably increase considerably.

By applying the per acre volume of scattered blowdown found on sample plots in Oregon and Washington to the sawtimber acreage in the most severely affected counties, scattered blowdown volume could reach a staggering 12.76 billion board feet in western Washington and Oregon.

State	Scattered blowdown per acre	Area of sawtimber	Total potential blowdown
	Bd. ft.	Acres	Bd. ft.
Washington	1,046	3,728,000	3,899,488
Oregon	1,123	7,890,000	8,860,470
Average	1,084		
Total		11,618,000	12,759,958

This is about six times as much scattered blowdown as has been reported. In 1952, it was found that about 80 percent of the blowdown occurred in this scattered category.

A rough estimate of the volume of windthrow occurring on small private ownerships, mostly on the fringes of the Willamette Valley of Oregon and the Puget Sound Trough in Washington, is based on aerial and ground samples taken on 6.4 million acres of this stand type. These data are summarized as follows:

State	Concentrated blowdown			Scattered blowdown		Total	
		Volume		Volume		Volume	
	Area	Gross	Net	Gross	Net	Gross	Net
	Acres	- - - - - -		Thousand board feet		- - - - - - -	
Washington West Side	13,771	61,631	58,925	589,803	563,910	651,434	622,835
Oregon West Side	36,192	599,329	487,674	1,038,091	882,378	1,637,420	1,370,052
Total	49,963	660,960	546,599	1,627,894	1,446,288	2,288,854	1,992,887

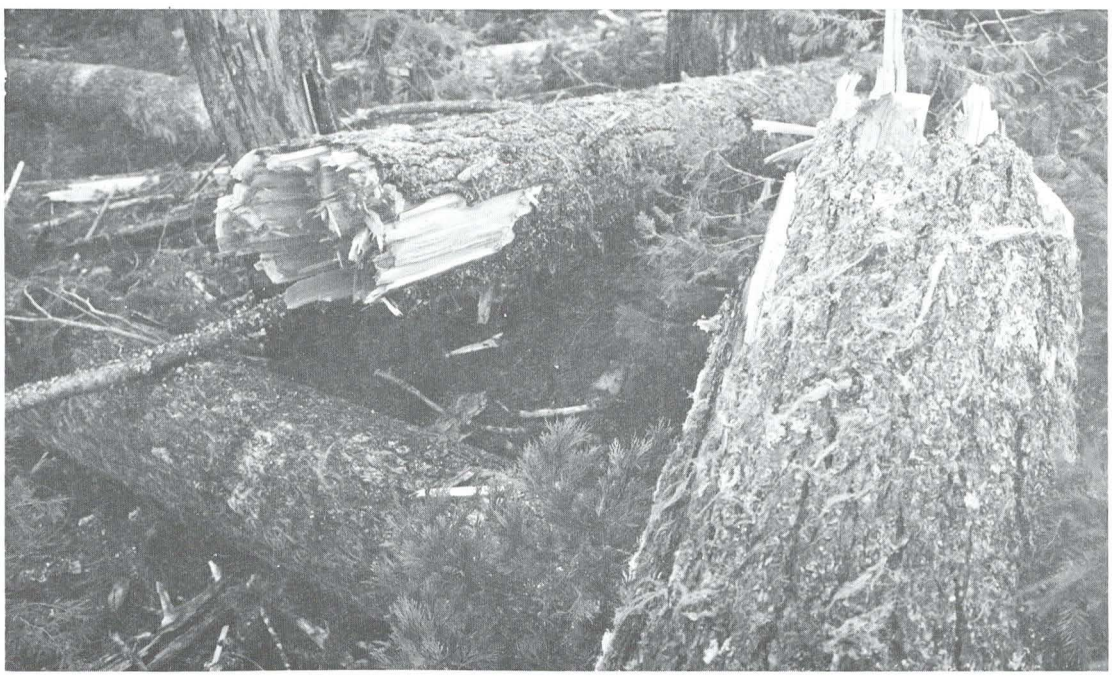
PLATE 2

Stands such as this are susceptible to additional windthrow, sunscald, mechanical damage, and disease.

Vast amounts of down material increase logging and fire prevention costs in Oregon and Washington forests.

PLATE 3

Scattered, shaded Douglas-fir windthrown trees such as this may trigger a severe Douglas-fir beetle outbreak in 1964. Tree-for-tree, shaded blowdown produces more beetles than trees exposed to the sun.



A few beetles per tree in concentrated Douglas-fir blowdown may produce large beetle populations in 1964 that could add significantly to tree-killing.

Table 1.--Estimated windthrown timber in Oregon and Washington

January 15, 1963

State, area, and agency	Concentrated blowdown			Scattered blowdown		Total blowdown	
		Volume		Volume		Volume	
	Area	Gross 1/	Net 2/	Gross 1/	Net 2/	Gross 1/	Net 2/
	Acres	Thousand board feet					
WASHINGTON							
West Side							
Private	97,518	2,179,345	1,746,781	1,965,262	1,665,641	4,144,607	3,412,422
State	5,418	279,445	232,875	0	0	279,445	232,875
National Forest	7,644	368,633	303,043	110,840	87,785	479,473	390,828
Bu. of Land Management	40	1,000	1,000	3/	3/	1,000	1,000
Bu. of Indian Affairs	40	1,000	1,000	3/	3/	1,000	1,000
All West Side	110,660	2,829,423	2,284,699	2,076,102	1,753,426	4,905,525	4,038,125
East Side							
Private	3/	3/	3/	100	100	100	100
National Forest	525	7,000	5,400	1,800	1,500	8,800	6,900
All East Side	525	7,000	5,400	1,900	1,600	8,900	7,000
All Washington	111,185	2,836,423	2,290,099	2,078,002	1,755,026	4,914,425	4,045,125
OREGON							
West Side							
Private	57,598	1,519,508	1,233,447	1,377,056	1,104,603	2,896,564	2,338,050
State	1,700	35,000	25,000	21,000	15,000	56,000	40,000
National Forest	47,139	809,560	628,940	490,600	384,460	1,300,160	1,013,400
Bu. of Land Management	37,997	1,260,300	1,090,800	531,553	304,957	1,791,853	1,395,757
All West Side	144,434	3,624,368	2,978,187	2,420,209	1,809,020	6,044,577	4,787,207
East Side							
Private	25,000	75,000	60,000	72,670	62,670	147,670	122,670
National Forest	13,155	36,385	31,825	52,759	45,974	89,144	77,799
Bu. of Land Management	0	1,000	1,000	3/	3/	1,000	1,000
All East Side	38,155	112,385	92,825	125,429	108,644	237,814	201,469
All Oregon	182,589	3,736,753	3,071,012	2,545,638	1,917,664	6,282,391	4,988,676
TOTAL OREGON & WASHINGTON	293,774	6,573,176	5,361,111	4,623,640	3,672,690	11,196,816	9,033,801

1/ Inventory volume, Scribner log scale.
2/ Potentially salvable volume, Scribner log scale.
3/ Data not yet available.

INSECT POTENTIAL IN WINDTHROWN TIMBER

The large volume of windfall created by the October 12 storm adds up to a potentially dangerous bark beetle situation. In the past, beetle epidemics have developed in Douglas-fir and ponderosa pine in this region and in Engelmann spruce in the Rocky Mountains and locally in the Northwest. It is likely that beetle epidemics may develop in Oregon and Washington forests during 1963 and 1964. The beetle potential in various species of windfall is as follows:

Douglas-fir.--Epidemic outbreaks of this beetle frequently develop in windthrown timber. Following a 9 billion board-foot blowdown in Oregon and Washington in the early 1950's, over 3 billion board feet of timber were killed by the Douglas-fir beetle. Lesser outbreaks have also developed from windthrown trees at other times.

While this beetle-windthrow association is frequent, it is not inevitable. Heavy windfall in northern California in 1921 caused no noticeable beetle problem. In the same year, an 8 billion board-foot blowdown on the Olympic Peninsula in Washington caused no extensive killing by the Douglas-fir beetle, presumably because the stand composition was predominately Sitka spruce and western hemlock. In 1958, about 500 million feet of Douglas-fir blew down in southwestern Washington and was heavily attacked the following summer. However, the expected beetle outbreak failed to materialize in 1960. This indicates that some factors or conditions in addition to blown down timber are required for development of a beetle epidemic.

Concentrations of blown down trees produce large beetle broods. However, the scattered single trees and small groups of trees produce--tree for tree--more beetles and are cause for concern. The scattered and shaded windfalls are more heavily attacked and will produce about six times as many beetles as trees exposed to the direct rays of the sun. Considerable benefit will be derived from salvaging the scattered blowdown, but it will only be partially successful because it is impossible to salvage all of this type of material before the beetles emerge in the spring of 1964.

There are some conditions now present that may minimize the possibility of a severe beetle epidemic. When the storm hit, Douglas-fir beetle populations were very low and while this is no guarantee that there will not be an epidemic, it is reason for mild optimism. Mild, relatively warm and dry weather has prevailed since the storm. This may have dried many of the down logs, making them less inviting for the beetles. The threat of severe tree-killing is great. It is well to assume that the worst will happen.

The Douglas-fir beetle will attack the windfalls in the spring of 1963 and emerge to attack green trees in the spring of 1964. Hence, salvage of the windthrow should be completed before the beetles emerge in the spring of 1964.

Ponderosa pine.--In ponderosa pine stands, windfall has generally been followed by increased outbreaks of the western pine beetle. Beetle-kill is greatest near heavy concentrations of blowdown where the beetle populations are high and the surrounding trees are in a susceptible condition. Even scattered ponderosa pine blowdown may lead to some increased tree mortality.

A severe storm in the early 1930's caused extensive windthrow in California, Oregon, Washington, and Idaho. This was followed by an increase in tree-killing by the western pine beetle and was due, in part, to high beetle populations then present and low tree vigor.

The western pine beetle is presently epidemic on parts of the Fremont, Deschutes, Malheur, and Ochoco National Forests in Oregon. These areas sustained considerable windthrow that could result in serious beetle problems this summer.

The western pine beetle will attack the down trees this spring and produce broods that will emerge about mid-August. Salvage of the windfalls should be completed before mid-August 1963 in order to lessen the loss.

Lodgepole pine.--The considerable amount of lodgepole pine blowdown down in southern Oregon could start a mountain pine beetle epidemic. However, there is little evidence that this will occur. Should an outbreak of the mountain pine beetle occur, green trees will be attacked in the summer of 1964. Preventative measures should be taken before then.

Spruce.--Engelmann spruce beetle epidemics often develop from windthrown trees. There are numerous examples of this in the Rocky Mountain States. In the Pacific Northwest, epidemic beetle outbreaks have also developed in windthrown trees. In this area, however, the damage is usually not great because of the limited amount of spruce.

Hemlock, Sitka spruce, true firs, redcedar, and larch.--Windthrow in these species does not create a significant bark beetle threat.

BEETLE CONTROL POSSIBILITIES

Douglas-fir.--If Douglas-fir beetle outbreaks occur in 1964, the only feasible control method forest managers can use is the salvage logging of infested trees. Chemical sprays are impractical.

Ponderosa pine.--Chemical control measures are available to combat western pine beetle outbreaks in ponderosa pine windfall. These methods are very expensive and should be used only as stop-gap measures until indirect control through logging high-risk and infested trees can be applied.

SALVAGE GOALS

The objective of all forest managers has been to harvest the maximum volume of windthrown timber prior to May 1, 1964 with a minimum of disruption of normal sale and cutting schedules. State and federal agencies have modified their timber sale procedures to expedite the salvage, and wood-using industries are making a determined effort to beat the beetles and save the region's timber supply from further destructive losses (plate 4).

Our most recent estimates indicate a total blowdown volume of 11.19 billion board feet, Scribner log scale, of which about 5.36 billion board feet are readily salvable. The remaining 5.83 billion board feet fell into different classes. Part can be harvested only if access road funds are made available. Some is in the form of scattered single trees and small groups of trees that cannot be salvaged economically until reached by the regular logging program.

The amount of blowdown sold and that actually logged to January 31, 1963 is as follows:

State, area, and agency	Blowdown volume reported for sale 1/	Sales	Blowdown volume		Percent sold	Volume remaining to be sold
			Sold 2/	Logged 3/		
	M bd.ft.	No.	- - M bd.ft. - -		Pct.	M bd.ft.
WASHINGTON						
West Side						
Private	3,412,422	4/	4/	4/	4/	4/
State	232,875	20	42,324.00	10,000.00	18.2	190,551.00
National Forest	390,828	64	22,270.30	630.50	5.7	368,557.70
Bu. of Land Management	1,000	4/	4/	4/	4/	4/
Bu. of Indian Affairs	1,000	1	1,000.00	1,000.00	100.0	0
All West Side	4,038,125	85	65,594.30	11,630.50	1.6	3,972,530.70
East Side						
Private	100	4/	4/	4/	4/	4/
National Forest	6,900	4/	355.00	20.00	5.1	6,545.00
Bu. of Indian Affairs	4/	1	100.00	100.00	4/	4/
All East Side	7,000	5	455.00	120.00	6.5	6,545.00
All Washington	4,045,125	90	66,049.30	11,750.50	1.6	3,979,075.70
OREGON						
West Side						
Private	2,338,050	4/	4/	4/	4/	4/
State	40,000	31	4,594.00	1,654.00	11.5	35,406.00
National Forest	1,013,400	168	110,980.00	11,267.07	11.0	902,420.00
Bu. of Land Management	1,395,757	4/	80,078.00	4/	4/	1,315,679.00
All West Side	4,787,207	199	195,652.00	12,921.07	4.1	4,591,555.00
East Side						
Private	122,670	4/	4/	4/	4/	4/
National Forest	77,799	58	40,827.00	7,305.88	52.5	36,972.00
Bu. of Land Management	1,000	4/	4/	4/	4/	4/
All East Side	201,469	58	40,827.00	7,305.88	20.3	160,642.00
All Oregon	4,988,676	257	236,479.00	20,226.95	4.7	4,752,197.00
TOTAL OREGON & WASHINGTON	9,033,801	347	302,528.30	31,977.45	3.3	8,731,272.70

1/ Blowdown considered for sale includes the concentrated and scattered net volumes shown in table 1.
2/ Volume sold to January 31, 1963 includes green timber necessary for economical logging.
3/ Volume logged to December 31, 1962.
4/ Data not yet available.

DETERIORATION OF WINDTHROWN TIMBER

The deterioration rate of windthrown timber from decay in increasing order of species resistance is as follows:

1. Western hemlock
2. True firs
3. Spruce; second-growth Douglas-fir
4. Pines
5. Old-growth Douglas-fir; western larch
6. Western redcedar

Within three to five years after windthrow, the least durable species will have little economically salvable volume left. Some salvage value will remain for 10 to 20 years or more in the more durable species, such as old-growth Douglas-fir and western redcedar. Decay rapidly reduces the high quality lumber values in the sapwood even though less than half the volume of the tree is destroyed. Because of this heavy immediate loss from decay, windthrown timber should be salvaged promptly. By the next rotation, the full impact of diseases that gained a foothold through broken branches and tops will show up as cull logs. This may prove the largest single loss resulting from the storm.

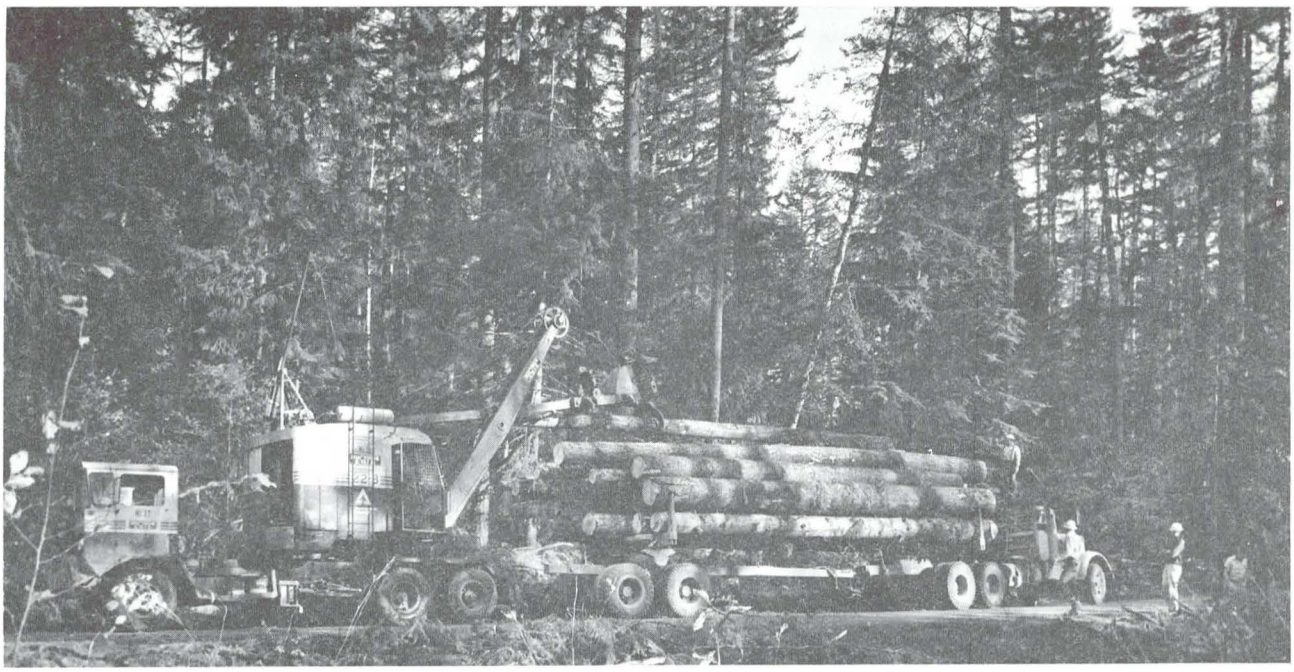
Even though the down trees are salvaged before the sapwood deteriorates, considerable degrade will have resulted from blue stain fungi introduced by bark beetles, especially in the various pine species.

RECOMMENDATIONS

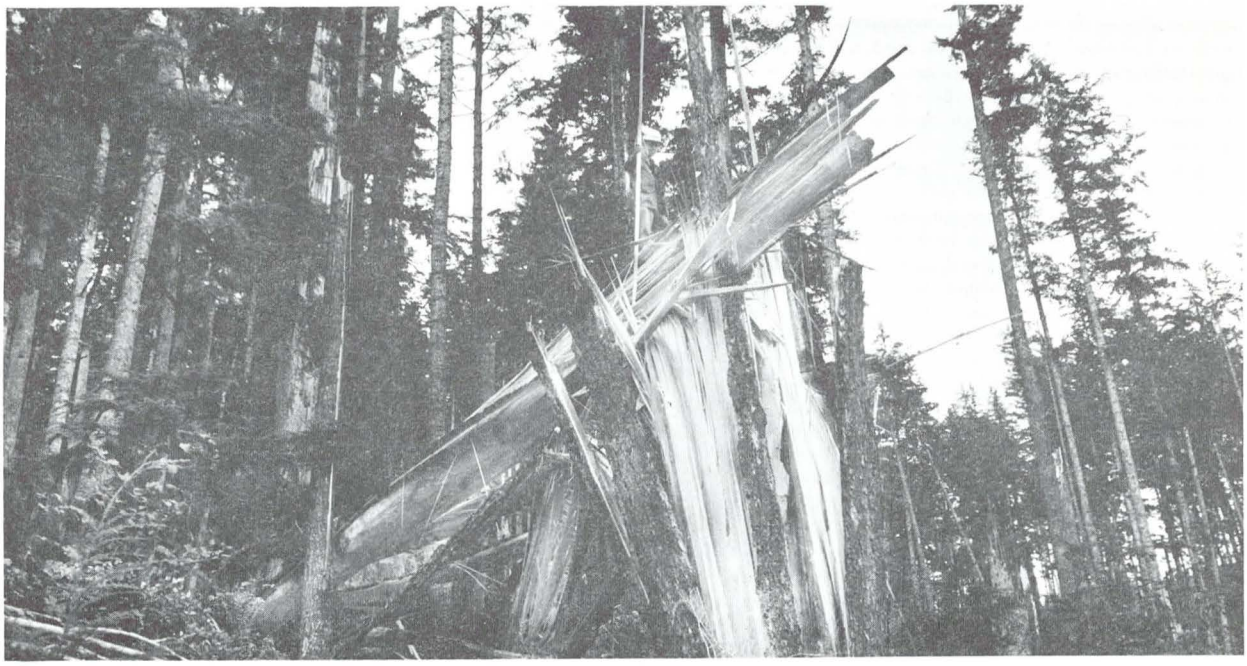
Future survey needs.--Aside from salvaging the windthrown timber, a serious problem facing forest managers is the possibility that a Douglas-fir beetle epidemic may develop in the windthrow and cause additional losses. The location of most concentrations of windthrow is fairly well known from aerial reconnaissance surveys. Additional surveys will be needed to determine the extent and volume involved in scattered blowdown. This type of information can best be obtained by ground examination of sawtimber stands. Surveys of this type are underway on West Side National Forests and on some industrial forest lands.

When the results of these surveys are known, the development of Douglas-fir beetle populations will be followed. Predictions of the beetle trend, based on judgment, will be made in the fall of 1963 to determine particularly hazardous beetle areas. Once these areas are known, it will provide the forest manager an opportunity to shift his logging into potentially hazardous areas.

PLATE 4



Salvage of windthrown timber began soon after the storm ended. Salvage is progressing rapidly in most areas.



Many trees were badly shattered and may never be salvaged. Large chunks left in the woods add significantly to the beetle hazard and fire prevention.

The need for a well-coordinated disaster survey plan was evident after this last storm. The Northwest Forest Pest Action Council's Timber Disaster Committee is working directly with industry and public agencies to draft such a plan so that it will be available for use next fall. The following items will be considered.

1. Objectives of a future survey.

2. Survey methods.

3. Reporting procedures.

4. Summary of blowdown information.

A survey plan for use in the event of a future timber disaster will be available in the fall of 1963.

Research needed.--The prime need at present is for a technique to determine the Douglas-fir bark beetle potential and predict damage trend in various ages and conditions of windfall in time to take effective action. We need to know what action will be economically feasible and effective in preventing or reducing outbreaks of the Douglas-fir beetle in blowdown. Research is needed to develop more efficient methods, either ground or photo, for making Douglas-fir beetle surveys.

APPENDIX

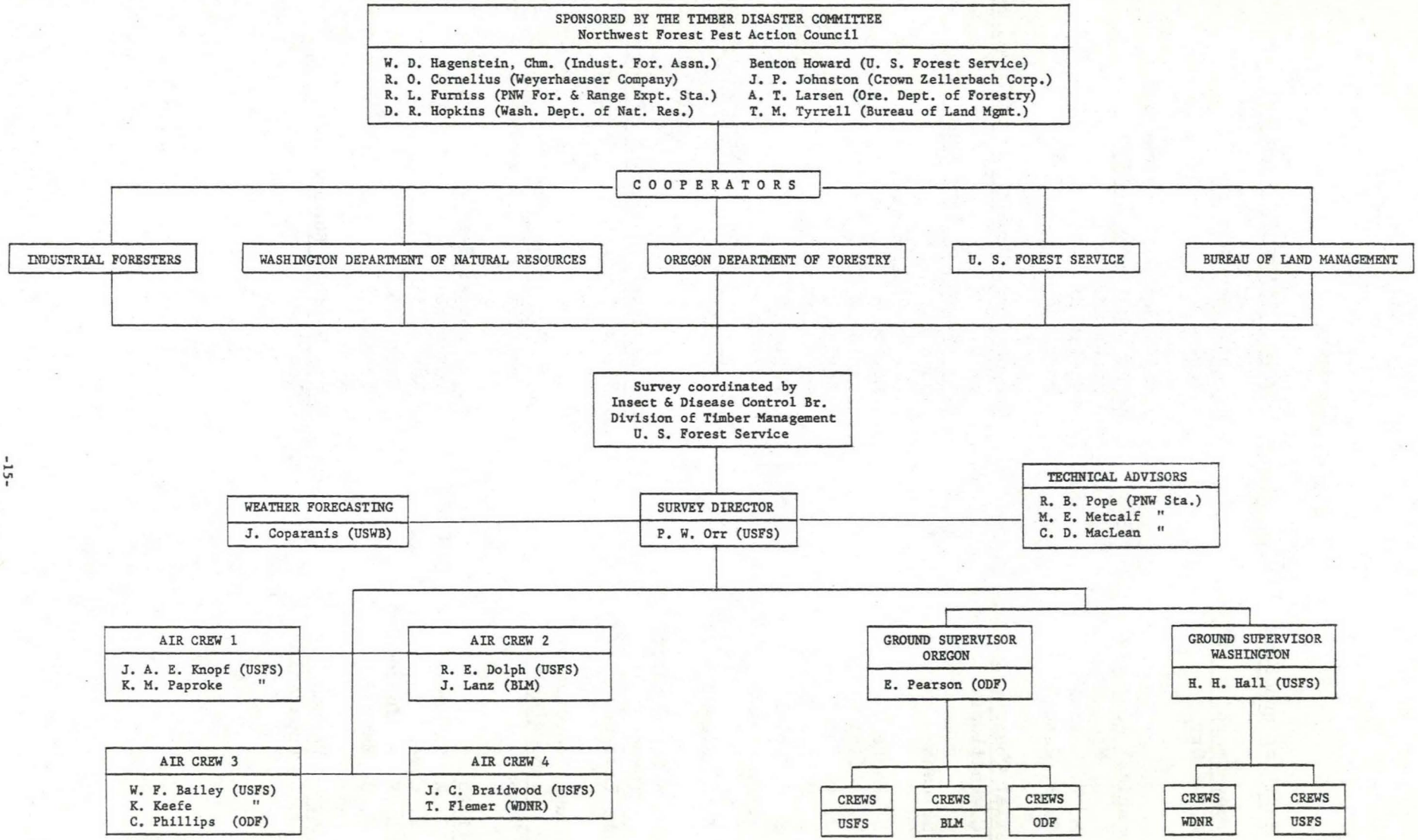
COOPERATION ON THE SURVEY

The survey was a cooperative project made by personnel from private industry, the States of Oregon and Washington forestry departments, Bureau of Land Management, and U. S. Forest Service. Many industrial forestry companies, the States of Oregon and Washington, and the Bureau of Land Management provided estimates of volume loss and maps showing the location of the blowdown on their lands.

The U. S. Weather Bureau Fire Weather Forecasting Service provided excellent forecasting service during the aerial phase of the survey. Each morning weather conditions were discussed with the aerial survey crews and the areas most likely to be clear were delineated.

The survey organization chart is shown on the following page.

THE 1962 COOPERATIVE BLOWDOWN SURVEY



SURVEY PERSONNEL

Position and Name	Organization and Location
Survey Coordinator	U. S. Forest Service
P. W. Orr	Region 6
	Pacific Northwest Forest and
Technical Advisors	Range Experiment Station
C. D. MacLean	Portland
M. L. Metcalf	Portland
R. B. Pope	Portland
Aerial Observers	Oregon State Department of Forestry
C. Phillips	Salem
	U. S. Bureau of Land Management
J. Lanz	Coos Bay
	U. S. Forest Service
K. Keefe	Region 1
W. Bailey	Region 2
J. A. Knopf	Region 4
J. C. Braidwood	Region 6
R. E. Dolph	Region 6
K. M. Paproke	Region 6
	Wash. State Dept. of Natural Resources
T. A. Flemer	Olympia
Ground Coordinator (Oregon)	Oregon State Department of Forestry
E. Pearson	Salem
Ground Coordinator (Washington)	U. S. Forest Service
H. Hall	Umatilla National Forest
Pilots	U. S. Forest Service
J. W. Childers	Region 6
J. Cowan	Region 6
L. H. A. Johnson	Region 6
H. J. Mays	Region 6
Weather Forecaster	U. S. Weather Bureau
J. C. Coparanis	Portland

SURVEY PERSONNEL (Continued)

Position and Name	Organization and Location
Cruisers	**Douglas Co. Fire Protection Assoc.**
G. Cole	Roseburg
L. Thornton	Roseburg
H. Tonole	Roseburg
	Oregon State Department of Forestry
J. Bradish	Albany
M. Anderson	Astoria
K. Palen	Forest Grove
E. Butler	Forest Grove
E. Beach	Springfield
R. C. Howell	Springfield
F. Kimmey	Springfield
C. Kiser	Springfield
R. Satterlee	Sweet Home
E. Rust	Tillamook
	U. S. Bureau of Land Management
R. Cole	Coos Bay
I. Johnson	Coos Bay
	U. S. Forest Service
R. Schimel	Gifford Pinchot National Forest
F. Shirley	Gifford Pinchot National Forest
C. G. Watson	Siskiyou National Forest
P. B. Wickham	Siskiyou National Forest
G. P. Meier	Siuslaw National Forest
R. E. Reindl	Siuslaw National Forest
C. W. Bechtel	Umpqua National Forest
R. Christensen	Umpqua National Forest
T. A. Davies, Jr.	Willamette National Forest
G. A. Ormund	Willamette National Forest
R. M. Orum	Willamette National Forest
	Wash. State Dept. of Natural Resources
S. Harvey	Alder
A. C. Allison	Kelso
C. J. Chambers	Kelso
H. F. Strobel	Kelso
L. Hegnes	Montesano
S. E. Lewis	Montesano
F. Friis	Olympia
D. Dowdell	Port Angeles

COOPERATING INDUSTRIAL OWNERS

Boise-Cascade Corporation
Brooks-Scanlon Lumber Company
Crown Zellerbach Corporation
Georgia-Pacific Corporation
Gilchrist Timber Company
Guistina Brothers Lumber Company
Hudspeth Pine, Incorporated
International Paper Company
J. Neils Lumber Company
Kaiser Gypsum Company, Incorporated
Klamath Lumber and Box Company
Modoc Lumber Company
Northern Pacific Railway
Ochoco Timber Company
Pine Products Corporation
Pope and Talbot, Incorporated
Publishers Paper Company
Puget Sound Pulp and Timber Company
Rayonier, Incorporated
Rosboro Lumber Company
Scott Paper Company
Spaulding Pulp and Paper Company
Tygh Valley Timber Company
U. S. National Bank
West Tacoma Newsprint Company
Weyerhaeuser Company
Willamina Lumber Company
Willamette Valley Lumber Company

C
O
P
Y

NORTHWEST FOREST PEST ACTION COUNCIL
TIMBER DISASTER COMMITTEE

1410 S. W. Morrison Street
Portland 5, Oregon

November 8, 1962

TO: INDUSTRIAL FOREST OWNERS IN OREGON AND WASHINGTON

Gentlemen:

Cooperative Survey of Blowdown

Preliminary estimates indicate that at least 4.5 billion board feet of timber in Washington and Oregon were windthrown by the Columbus Day storm. The total amount may be several times this. These preliminary figures have served their purpose by calling attention to the magnitude of our salvage problem. A more reliable estimate, based on a coordinated survey, is now needed.

The Northwest Forest Pest Action Council's Timber Disaster Committee has recommended that the survey be made and that major public and private landowners be asked to cooperate. U. S. Forest Service has accepted responsibility for administering this survey and has obtained funds to pay for the major portion of it.

Objectives of the survey are: (1) Provide a map showing location of blowdown by three broad intensity classes -- light, moderate, and heavy; (2) Provide an estimate of total volume of blowdown within each of the two states.

The date set for completion of the survey is January 1, 1963, which allows six weeks for data collection and two weeks for compilation. Within this time limitation, it will be impossible to conduct an independent survey over the 25 million acres affected by the storm. Only way to do it is to ask all major forest owners to provide data on their lands with remaining area to be covered by combination aerial-ground survey.

Your cooperation is requested in furnishing the desired area and volume data on your lands according to the standards explained below. Public agencies are similarly being asked for the same information.

Experience gained in surveying the blowdown of December 1951 indicated that windthrow can be divided into two classes. Most spectacular are the scattered and erratic patches of concentrated blowdown where substantial portions of stand have been uprooted or broken off. Whenever about 10 percent or more of the stems are down, these patches can be recognized by aerial observation or photography and can be mapped in place. Our preliminary estimates of volume loss are based principally on this type of blowdown.

The other class of blowdown occurs as scattered single trees and small groups widely distributed. A significant finding of the 1952 survey was that over 80 percent of the total blowdown was in this class, while less than 20 percent occurred in the visible patches of concentrated damage. Perhaps the ratio is not nearly so high in the present instance, but our past experience indicates that scattered blowdown is likely to be substantial and must be sampled.

The information desired from major forest landowners is a map showing blowdown damage by broad intensity classes, and estimates of the volumes for both the "concentrated" and "scattered" types of blowdown.

The map must of necessity be based on the visible patches of concentrated blowdown which many major landowners have already mapped from the air. In order to combine data from many sources, it will be necessary for these maps to be adjusted to a common standard. The standards used in the 1952 survey, based on the number of acres of concentrated blowdown per section, still seem satisfactory. Their use will permit comparing pattern and intensity of the two disasters.

For purposes of the map concentrated blowdown is defined as patches, 10 acres and larger, on which 10 percent or more of the stems are uprooted, or broken. The number of acres in a given section determines the blowdown intensity class for that section, according to following standards.

Blowdown Intensity	Size of Concentrated 1/ Blowdown (Acres per Section)	Map Symbol
Heavy	80 or more	H
Moderate	40 - 79	M
Light	10 - 39	L
None	0 - 9	0

1/ In patches 10 acres or larger having 10 percent or more of the stems down.

We would appreciate, from each owner capable of furnishing it, a map showing the blowdown intensity of each section in his ownership. A scale of 1/2 inch to 1 mile is preferred. We suggest that this could be made by examining your detailed blowdown map, adjusting to above standards, approximating the acreage of concentrated blowdown in a particular section and marking the appropriate symbol in the middle of the section on the map.

In addition to the map, we would appreciate estimates of the volume in both concentrated and scattered blowdown classes. These should be based on some measured plots taken in both types of blowdown. Average per-acre blowdown volumes from these samples can then be applied to the concentrated blowdown acreage from the map and to estimates of the total sawtimber acreage.

Field samples or cruises which you have taken, or plan, should provide the necessary volume data. Any form, such as plots, strips, or 100 percent cruises of blowdown patches are satisfactory. A light sample will suffice and judgment can be used to restrict the sample to reasonably accessible areas. It is important to have at least a few measured samples to form the basis for objective estimates.

Attached is a form showing the desired data on concentrated blowdown acreage and gross and net volumes for both concentrated and scattered blowdown.

The map and the volume data are needed by Dec. 1 so that they can be compiled by Jan. 1. All data will be treated confidentially and the only data released will be totals, unidentifiable by individual owner.

If you have any questions concerning the survey or data we are requesting, please contact P. W. Orr, Division of Timber Management, U. S. Forest Service, P. O. Box 3623, Portland 8, Oregon.

Please send maps and data to the undersigned at 1410 S.W. Morrison St., Portland 5, Oregon.

Very truly yours,

/s/ W. D. Hagenstein

WDH:ee
Attachment

W. D. Hagenstein
Chairman

ESTIMATED ACREAGE AND VOLUME OF
1962 WINDTHROWN TIMBER

(Fill data in appropriate state and area)

Areas	Concentrated Blowdown			Scattered Blowdown		Total Blowdown	
	Acreage	Volume 1/		Volume 1/		Volume 1/	
		Gross	Net	Gross	Net	Gross	Net
Washington:							
Westside							
Eastside							
Oregon:							
Westside							
Eastside							

1/ Volume in Scribner Log Scale Standards are as follows:

Blowdown intensity	Minimum of stand down Pct.	Size of blowdown Ac./Sec.	Map symbol
Heavy	10	80 or more	H
Moderate	10	40 - 79	M
Light	10	10 - 39	L
Limited	Less than 10	Less than 10	O

Reporting owner: _____

Reported by: _____

Date: _____

Return data to:

Timber Disaster Committee
1410 S.W. Morrison St.
Portland 5, Oregon

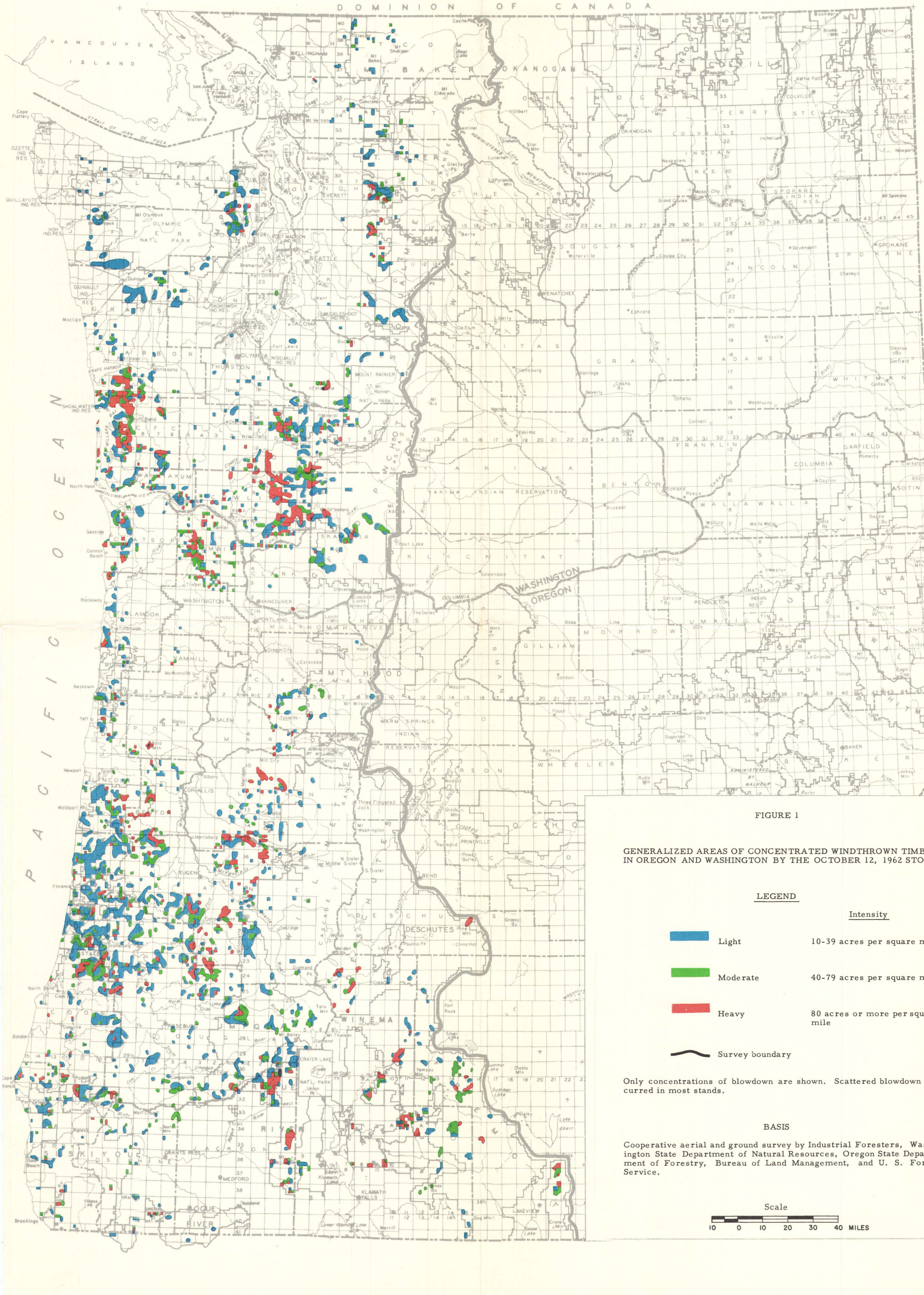
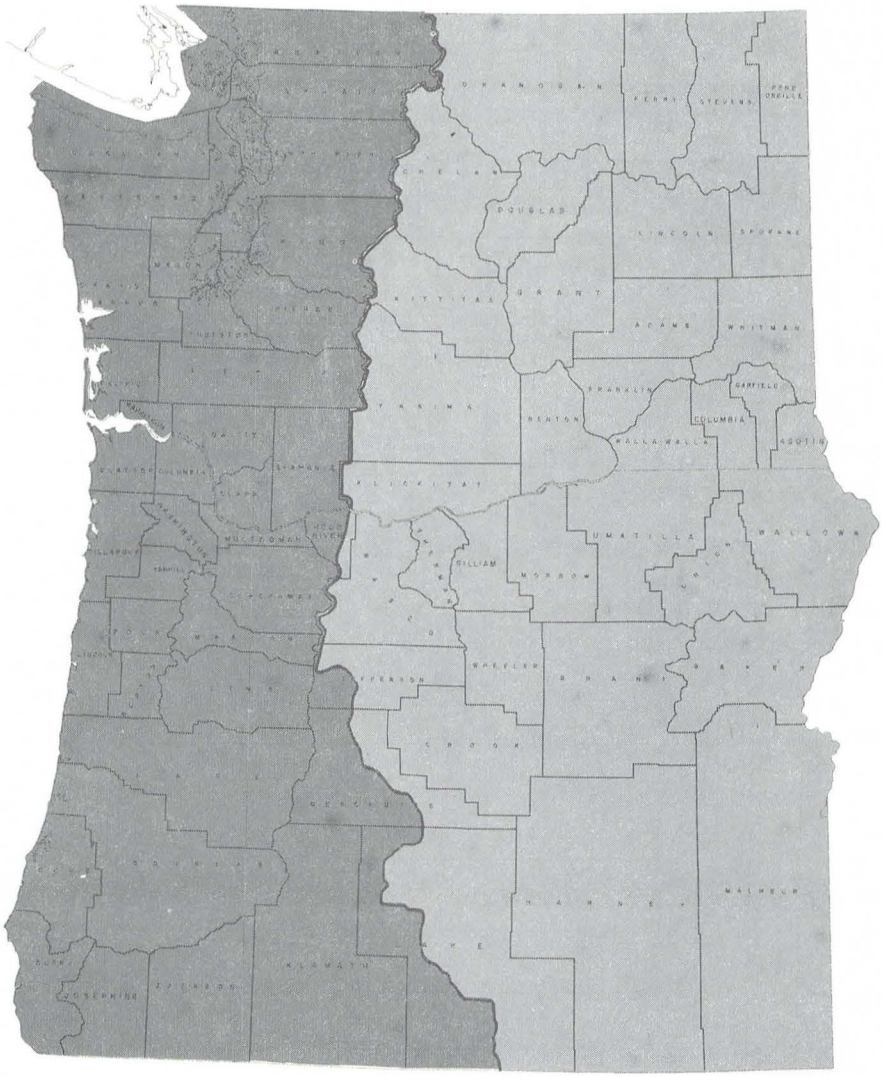

DOMINION OF CANADA
VANCOUVER ISLAND
PACIFIC OCEAN
WASHINGTON
OREGON
STRAIT OF JUAN DE FUCA
GEORGIA STRAIT
Victoria
BELLINGHAM
EVERETT
SEATTLE
TACOMA
OLYMPIA
PORT ANGELES
Mt Olympus
OLYMPIC NAT'L PARK
Mt Baker
Mt Shuksan
Glacier Pk
Mt Rainier
NAT'L PARK
MOUNT RAINIER
Mt Adams
Mt St Helens
Mt Hood
Mt Jefferson
Three Fingered Jack
Mt Washington
Mt Thielsen
Mt Scott
CRATER LAKE
Mt Bailey
Diamond L.
Mt Elderado
Mt Vernon
Arlington
Sultan
Concrete
Darrington
Lucerne
Chelan
Wenatchee
Berne
Waterville
Ephrata
Ellensburg
Cle Elum
Yakima
Toppenish
Grand Coulee
Mason City
Coulee City
Almira
Davenport
Cheney
Spokane
Colville
Kettle Falls
Republic
Tonasket
Omak
Okanogan
Oroville
Brewster
Nespelem
Inchelium
Newport
Springdale
Mt Spokane
Ritzville
Othello
Connell
Pullman
Dayton
Pasco
Richland
Prosser
Wallula
Walla Walla
Umatilla
Pendleton
La Grande
Baker
Burns
Bend
Redmond
Prineville
Madras
Warm Springs Indian Reservation
Yakima Indian Reservation
Colville Indian Reservation
Spokane Indian Reservation
Quinault Ind. Res.
Hoh Ind. Res.
Ozette Ind. Res.
Quillayute Ind. Res.
Makah Ind. Res.
Skokomish Ind. Res.
Nisqually Ind. Res.
Muckleshoot Ind. Res.
Port Madison Ind. Res.
Tulalip Ind. Res.
Swinomish Ind. Res.
Lummi Ind. Res.
Shoalwater Ind. Res.
Kalispell Ind. Res.
Coeur d'Alene
Aberdeen
Hoquiam
Montesano
Raymond
South Bend
Chehalis
Centralia
Longview
Kelso
Vancouver
Portland
Astoria
Seaside
Cannon Beach
Rockaway
Tillamook
McMinnville
Newport
Waldport
Florence
Reedsport
Coos Bay
North Bend
Bandon
Port Orford
Gold Beach
Brookings
Grants Pass
Medford
Ashland
Klamath Falls
Lakeview
Albany
Corvallis
Eugene
Salem
Oregon City
Hillsboro
Forest Grove
Estacada
Sandy
Bingen
Goldendale
Stevenson
Cascade Locks
Hood River
The Dalles
Maupin
Madras
Condon
Fossil
Heppner
Pendleton
Milton-Freewater
Elgin
Enterprise
Joseph
Wallowa
Halfway
Baker
Sumpter
Burns
Prineville
Sisters
Bend
Redmond
Lapine
Crescent
Chemult
Silver Lake
Fort Rock
Paisley
Lakeview
Summer Lake
Yamsay Mtn
Diablo Mtn
Crane Mtn
Dog Mtn
Steptoe Bu
Garfield
Colfax
Pomeroy
Clarkston
Asotin
Saddle Bu
Table Mtn
Troy
Weston
Meacham
Grassy Bu
Pine Mtn
China Hat
Powell Buttes
Grizzly Mtn
Grassland
Paulina Pk
Diamond Pk
Maiden Pk
Three Fingered Jack
Mt Washington
Mt Jefferson
Mt Hood
Mt Adams
Mt St Helens
Mt Rainier
Mt Baker
Glacier Pk
Mt Shuksan
Mt Olympus
Mt Elderado
Mt Vernon
Mt Spokane
Mt Fanny
Mt Aix
Mt Addams
Mt Wilson
Mt Scott
Mt Bailey
Mt Thielsen
Mt Hood
Mt Rainier
Mt Baker
Mt Shuksan
Mt Olympus
Mt Elderado
Mt Vernon
Mt Spokane
Mt Fanny
Mt Aix
Mt Addams
Mt Wilson
Mt Scott
Mt Bailey
Mt Thielsen
Mt Hood
Mt Rainier
Mt Baker
Glacier Pk

FIGURE 2

1962 BLOWDOWN SURVEY AREAS



LEGEND

Major damage area. Concentrated blowdown mapped. Volume of concentrated and scattered blowdown available.

Minor damage area. Mainly scattered blowdown. Volume estimates available.

Cooperative survey coordinated by U. S. Forest Service. Survey cooperators: Industrial Foresters, Washington State Department of Natural Resources, Oregon State Department of Forestry, and Bureau of Land Management.

LIBRARY U.S. FOREST SERVICE BERKELEY